

Question1

Solution :

There are two parts of solution.

(1) Check if the snake has venom level M(greedy search):

First, start from the first DNA letter and search the first M letters 'S', and mark other letters before the Mth 'S' as 'delete'. After the letter 'S', begins at the Mth 'S' and search the first M letters 'N' and mark other letters before the Mth 'N' but after the Mth 'S' as 'delete'. After repeat the search and mark for letters 'A', 'K', 'E'.

When we find the Mth letter 'E', we need to mark the remaining letters after Mth 'E' as 'delete'.

If we can find M letters 'S', 'N', 'A', 'K', 'E' in order, it means that the snake has venom level M or above.

Else, if we can not find M letters of 'S', 'N', 'A', 'K', 'E', it means that the snake doesn't have venom level M or above.

(2) Compute the maximum venom level the snake could have:

First set the left side L as 0 and the right side R as $n/5$ (n is the length of DNA) and median M as $\lfloor (L + R)/2 \rfloor$.

Then check if the snake has venom level M. If the snake has venom level M then set L as M, if not, set R as M-1. Compute M as $\lfloor (L + R)/2 \rfloor$ again.

At last, repeat the step until $L=R$ and the maximum venom level the snake could have is L.

Proof:

As described above, the time complexity of (1) is $O(n)$ and the time complexity of (2) is $O(\log(n))$.

The total time complexity is $O(n \log(n))$.